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REMARKS/ARGUMENTS

The Office Action of June 27, 2006 has been carefully reviewed and this Response addresses the Examiner's concerns.

I. Status of the Claims

Claims 1, 3-24, and 29 are pending in this present Application prior to this Response. Claims 25-28 have been withdrawn from consideration at this time. Claims 1, 3-16, 19-22, and 29 have been rejected. Claims 17, 18, 23, and 24 have been objected to but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In this Response, independent claims 1 and 29 and dependent claims 17 and 18 have been amended to better describe the invention.

II. Claim Rejections

(a) On pages 2 and 3 of the Office action, claims 1, 3-8, 12-16, and 29 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 402037954.

(b) On page 4 of the Office action, claims 9-11 and 19-21 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 402037954 in view of JP 2-274846

III. Allowable Subject Matter

On page 4 of the Office action, claims 17, 18, 23, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims.

IV. Amendments to Claims

Independent claims 1 and 29 have been amended to better describe the invention. In particular, the limitation of "humidifying a gas to a predetermined moisture content to form a humidified atmosphere" has been added to better describe the preparation of the gas prior to exposure to the surface of the molten aluminum. Also, the step of solidifying the molten aluminum alloy has been amended to include the limitation of "substantially maintaining the predetermined moisture content of the humidified atmosphere near the surface during

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solidification phase of the molten aluminum alloy". Further, independent claims 1 and 29 have been also amended to describe the humidified atmosphere being "introduced near" the surface of the molten aluminum alloy, thereby necessitating the deletion of the term "contacting", to better describe the invention.

Dependent claims 17 and 18 have been amended to correspond with the amendments of independent claim 1.

V. Support in the Specification for Claims 1 and 29 Amendments

Support for Independent Claims 1 and 29 recitals of "humidifying a gas to a predetermined moisture content to form a humidified atmosphere", "introducing the humidified atmosphere near a surface of the molten aluminum alloy", and "substantially maintaining the predetermined moisture content of the humidified atmosphere near the surface during solidification phase of the molten aluminum alloy" can be found in paragraphs [0039] thru [0043] and Figure 20 of Applicants' specification.

VI. Rejections under 35 USC §103

Applicants respectfully point out that in order for a rejection under 35 U.S.C. §103 to be sustained, the Examiner must establish a prima facie case of obviousness. As pointed out in Section 2142 of the MPEP, one of the three criteria to establish a prima facie case of obviousness is that the prior art reference(s) must teach or suggest all the claim limitations. Applicants assert that JP 402037954 (JP '954) and JP 2-274846, individual or in combination, do not teach or suggest all the claim limitations of independent claims 1 and 29 as amended herein.

JP '954 discloses a low pressure casting device wherein a melt is held in a heated air-tight crucible with one end of a stalk inserted into the melt and the other end of the stalk protruding from the crucible and connected to the melt injection port of a separate die. *Certified Translation of '954 (enclosed), Pg. 2, ln 1-6, ln 20-21.* A pressurized gas having a moisture content of 4 g/cm^3 or less is used to apply a pressure to the surface of the melt in the air-tight crucible to cause the melt on the bottom of the crucible to move up into the stalk and into the separate die. *Id. Pg 2, ln 24 – Pg. 3, ln 2.* JP '954 uses a dehumidifier 4 in-line between an air compressor 1 and air-tight crucible 2 to reduce the moisture content of the pressurized gas being introduced into the

air-tight crucible 2. *Id. Pg. 3, ln 17-20, Fig. 1.* Therefore, JP '954 teaches away from Applicants' claimed invention that requires the humidifying of the gas to a predetermined moisture content and substantially maintaining the gas at the predetermined moisture content throughout the casting process, including solidification.

Further, the die cavity disclosed in JP '954 is not in direct communication with the pressurized gas atmosphere in the air-tight crucible, meaning that the pressurized gas introduced into the air-tight crucible is not introduced into the die where the melt solidifies. *Id. Fig. 1.* On the contrary, the die cavity disclosed in JP '954 must not be positively pressurized to the same levels as the air-tight crucible, if at all, to allow the melt to flow into the die. JP '954 does not disclose the atmospheric conditions of the die cavity before, during, or after the casting process, including the solidification phase. Therefore, it is reasonable to imply that the molten aluminum alloy in the die is never exposed to or in direct contact with the pressurized gas.

Applicants resolve the right to provide arguments with regards to JP 2-274846 in a future correspondence, if necessary.

Applicants enclose herein copies of the certified translations of the Japanese references JP 402037954 and JP 2-274846.

In view of the amended independent claims 1 and 29 and arguments presented in this Response, Applicants respectfully request that the 35 U.S.C. 103(a) for claims 1, 3-16, 19-21, and 29 be withdrawn because JP 402037954 and JP 2-274846 do not singularly or combined disclose, teach, or suggest the limitations of "humidifying a gas to a predetermined moisture content to form a humidified atmosphere", "introducing the humidified atmosphere near a surface of the molten aluminum alloy", and "substantially maintaining the predetermined moisture content of the humidified atmosphere near the surface during solidification phase of the molten aluminuum alloy".

Thus, in view of the foregoing amendments and remarks, Applicants believed that this present Application is in condition for allowance, which action is earnestly solicited. The Examiner is invited to call Applicants' counsel at (724) 337-4185 at the time of review of this Response, in order to have answered any remaining questions and to expedite issuance of the allowable subject matter.

Though no fees are required, the Director of Patents and Trademarks is authorized to charge any additional fees, or to credit overpayment, to Deposit Account No.01-1000, Order No. 02-2453.

Respectfully submitted,
Paula L. Kolek, et al, Applicants

Date: September 27, 2006

By: [signature]

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Enclosures/2

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Notarized Certification

TECHNICAL LANGUAGE SERVICES, INC. A NEVADA CORPORATION, HEREBY DECLARES THAT, TO THE BEST OF ITS KNOWLEDGE AND BELIEF, THE ATTACHED TRANSLATION OF "JP 2-274846 A" [TLS-CT-5457; Client Ref. 02-2453], PREPARED BY ONE OF ITS TRANSLATORS, IS A TRUE, ACCURATE AND COMPLETE ENGLISH LANGUAGE TRANSLATION OF THE ACCOMPANYING SOURCE DOCUMENT IN THE JAPANESE LANGUAGE.

Karen Leyton

Karen Leyton
Chief Operating Officer

Subscribed and sworn to before me this 26th *day of* September ,2006

Notary Public Eugene J. Joseph Jr.

Notary Public's Seal
EUGENE J. JOSEPH, JR.
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JAPANESE / ENGLISH TRANSLATION OF

Source: Japanese Patent No. JP 2 – 274846 A

Title of the Invention: Method for Manufacturing Formable Aluminum Alloy Material

Your Reference No.: 02-2453

For: Alcoa

Requester: Kimberly Merichko

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(19) Japanese Patent Office (JP)

(11) Unexamined Patent Application (Kokai) No.

(12) **Unexamined Patent Gazette (A)**

2–274846

(51) Int. Cl.⁵	Classification Symbols	Internal Office Registration Nos.	(43) Date of Publication: November 9, 1990
C 22 F 1/04	C	8015-4K	
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(54) Title of the Invention: Method for Manufacturing Formable Aluminum Alloy Material

(21) Application No.: 1–93070

(22) Date of Filing: April 14, 1989

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SPECIFICATION

1. Title of the Invention

Method for Manufacturing Formable Aluminum Alloy Material[1]

2. Claims

(1) A method for manufacturing a formable aluminum alloy material, characterized in comprising:

[1] Translator's note: The term's more literal translation is "aluminum alloy material for forming."

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casting an aluminum alloy having a composition comprising 0.5 to 1.5% Mn, 0.8 to 1.5% Mg, 0.1 to 0.5% Cu, 0.1 to 1.0% Si, 0.2 to 0.6% Fe ("%" hereinafter indicates "weight %"), with the remainder being substantially Al;

homogenizing the alloy at 560°C or greater;

hot-rolling the alloy at a draft of 99.5% or greater;

forming a recrystallized structure by keeping the temperature of the aluminum alloy material at 300°C or greater when the hot rolling is completed;

heating the material a temperature of 400 to 600°C at a rate of 100°C per minute or greater in an atmosphere having a dew point of 30°C or greater either immediately or after performing cold rolling at a draft of 5% or greater without repeating the recrystallization;

cooling and annealing the material at a cooling rate of 100°C per minute or greater either immediately after the heating or after allowing the material to stand for five minutes; and

cold-rolling the material at a reduction ratio of 10% or greater and less than 86%.

(2) The method for manufacturing a formable aluminum alloy material according to claim 1, characterized in that said aluminum alloy further contains at least one type of element selected from the group consisting of 0.005 to 0.2% Ti, 0.01 to 0.5% Zn, 0.01 to 0.3% Cr, and 0.0001 to 0.3% B.

3. Detailed Description of the Invention

(Field of Industrial Application)

The present invention relates to a method for manufacturing a formable aluminum alloy material, and more particularly relates to a method for manufacturing a can-body aluminum alloy plate or other aluminum alloy material that has minimal anisotropy, high strength, and excellent surface properties as a shaped product.

(Prior Art)

Conventional aluminum can bodies are produced using primarily the AA3004 alloy, which has appropriate strength and shaping properties. Other recent trends include gauging down of materials and the use of thin coatings on can bodies in view of considerations such as resource conservation.

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(Problems to Be Solved by the Invention)

The above-mentioned use of thin coatings has an adverse effect on the surface properties of the formed articles as such, producing flow marks and the like, and the appearance of the product is compromised. The gauging down of materials requires a corresponding increase in strength above the conventional level, and although some improvement in strength can be secured, the earing ratio decreases and the requirements ultimately cannot be sufficiently satisfied.

An object of the present invention is to overcome the drawbacks of the conventional method for manufacturing a formable aluminum alloy plate and to provide a method for manufacturing a formable aluminum alloy material that has excellent surface qualities when shaped into a can body, satisfies both high strength and low earing ratio requirements, and does not cause a reduction in productivity.

(Means Used to Solve the Above-Mentioned Problems)

Specifically, the present invention provides (1) a method for manufacturing a formable aluminum alloy material characterized in comprising: casting an aluminum alloy having a composition comprising 0.5 to 1.5% Mn, 0.8 to 1.5% Mg, 0.1 to 0.5% Cu, 0.1 to 1.0% Si, 0.2 to 0.6% Fe ("%" hereinafter indicates "weight %"), with the remainder being substantially Al; homogenizing the alloy at 560°C or greater; hot-rolling the alloy at a draft of 99.5% or greater; forming a recrystallized structure by keeping the temperature of the aluminum alloy material at 300°C or greater when the hot rolling is completed; heating the material to a temperature of 400 to 600°C at a rate of 100°C per minute or greater in an atmosphere having a dew point of 30°C or greater either immediately or after performing cold rolling at a draft of 5% or greater without repeating the recrystallization; cooling and annealing the material at a cooling rate of 100°C per minute or greater either immediately after the heating or after allowing the material to stand for five minutes; and cold-rolling the material at a reduction ratio of 10% or greater and less than 86% (referred to as the "first invention"), and

(2) the method for manufacturing a formable aluminum alloy material according to claim 1, characterized in that the aluminum alloy further contains at least one type of element selected

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from the group consisting of 0.005 to 0.2% Ti, 0.01 to 0.5% Zn, 0.01 to 0.3% Cr, and 0.0001 to 0.3% B.

The reasons for the limitations and the functions of the components of the aluminum alloy used in the present invention will be described below.

The Mn content is set to 0.5 to 1.5%. Mn functions to improve strength, forms a crystallization phase, and acts to prevent tool burn during ironing. These effects are minor at a content of less than 0.5%, whereas if the content exceeds 1.5%, giant crystals will be formed, and various forming properties will be adversely affected rather than improved.

The Mg content is set to 0.8 to 1.5%. Mg improves strength in a solid solution and is the main element in the precipitates produced during the coating process. The strength is insufficient if the Mg content is less than 0.8%, whereas if the Mg content exceeds 1.5%, the surface and shaping properties of the formed article will be compromised because an oxide film will be formed under the high temperatures of the intermediate annealing, regardless of the atmosphere.

The Cu content is set to 0.1 to 0.5%. Cu forms a solid solution or fine precipitates, which improves the strength. A sufficient improvement in strength cannot be expected if the Cu content is less than 0.1%, and if the content exceeds 0.5%, the shaping and anti-corrosion properties will be compromised.

The Si content is set to 0.1 to 1.0%. Si causes a fine precipitate to be formed and improved strength to be obtained. Si also enters the crystallization products and yields improved ironing properties. The desired effect cannot be expected if the content is less than 0.1%, whereas the shaping properties [of the alloy] will be compromised if the content exceeds 1.0%.

The Fe content is set to 0.2 to 0.6%. Fe displays essentially the same effects as Mn, and crystallizes during annealing. Fe also reduces the size of the recrystallized crystal grains because the crystals serve as the sites for forming recrystallization nuclei. Tool burn during ironing will not be prevented if the Fe content is less than 0.2%, and if the content exceeds 0.6%, giant crystals will readily form and the shaping properties will be compromised.

According to the second invention, the aforementioned alloy composition additionally contains at least one type of element selected from the group consisting of 0.005 to 0.2% Ti, 0.01 to 0.5% Zn, 0.01 to 0.3% Cr, and 0.0001 to 0.3% B.

Ti or B have an effect on the annealing structure, and are considered to be a factor in determining the crystal distribution. The annealing structure will be coarse and the shaping

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properties during the rolling and can-forming steps will be compromised if the Ti content is less than 0.005% or the B content is less than 0.0001. Giant Ti or B crystals will form and the shaping properties will be degraded if the Ti content exceeds 0.2% or the B content exceeds 0.3%.

Cr has the same effect as Mn and Fe, and improves the ironing properties [of the alloy]. The reasons that the content is set in a range of 0.01 to 0.3% are the same as for Mn and Fe.

Zn forms a solid solution or fine precipitates, and improves the strength. A sufficient improvement in strength cannot be expected if the Zn content is less than 0.01%, and if the content exceeds 0.5%, the anti-corrosion properties [of the alloy material] will be compromised.

In the present invention, the aluminum alloy having the above-described composition is cast, and the cast ingot is homogenized at 560°C or greater. If homogenization is performed at less than 560°C, fine and highly dense crystals will be produced, inferior shaping properties will result, recrystallization of the hot-rolled product will be inhibited, coarse crystals having diameters exceeding 100 μm will be formed, and the surface properties of the can are compromised.

The homogenized alloy is hot-rolled at 99.5% or greater, and the temperature is set to 300°C or greater, and preferably 390 to 320°C, when the hot rolling is completed, whereby a hot-rolled plate in which recrystallization has been completed is obtained. The hot-rolled plate will not form a recrystallization structure and will be unable to yield an aluminum alloy material with the prescribed low caring ratio if the hot-rolling draft is less than 99.5% or the temperature at the completion of hot-rolling is less than 300°C. Also, the size of the recrystallized grains obtained by the above steps is normally 100 μm or less.

A heat treatment that involves rapid heating is performed immediately after the hot rolling or after the alloy has been cold-rolled at 5% or less. However, recrystallization will be repeated in the subsequent heat treatment and the earing ratio will be compromised if the cold-rolling is performed at a draft which exceeds 5%.

The subsequent annealing is performed by first heating the material to a temperature of 400 to 600°C at a heating rate of 100°C per minute or greater in an atmosphere having a dew point of 30°C or less, and then cooling the material at a cooling rate of 100°C per minute or greater either immediately or after letting the material stand for five minutes.

The annealing serves to enhance the age hardening during painting and baking the can by increasing the amount in which the Cu or Si element forms a solid solution. However, the oxide film formed on the surface will have an increased thickness and inferior surface properties will result if the dew point exceeds 30°C at the heating temperature. The oxide film will also become thicker and inferior surface properties will result if the holding time exceeds five minutes, even if the dew point is 30°C or less.

The Mn or Fe element precipitates out at a temperature of 400 to 600°C, resulting in a reduced strength. Therefore, the strength-reducing effect will increase and a lower strength will be obtained if the standing time at 400 to 600°C exceeds five minutes or the heating rate is less than 100°C per minute, or if the cooling rate is less than 100°C per minute.

Following the aforementioned annealing, cold rolling is performed at 10% or greater and 86% or less. However, the ironing properties are severely compromised if the draft is less than 10%. Also, the earing ratio increases considerably if the draft is 86% or greater.

(Working Examples)

The present invention will next be described in detail based on the working examples.

An aluminum alloy having the components shown in Table 1 was melted and cast to form a 500 mm cast ingot. Samples with various thicknesses were prepared by cutting the ingot to a certain depth. A can-body material having a thickness of 0.3 mm was produced from these samples by the steps shown in Table 2.

Table 3 shows the results of testing the various properties required of can bodies. The aforementioned samples were used in the testing. The alloy compositions are shown in weight percent.

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[Table 1] (Weight percent)

No.		Si	Fe	Cu	Mn	Mg	Ti	Cr	Zn	B	Al
Working Examples	1	0.20	0.41	0.15	1.1	1.1	0.02	0.01	0.02	0.002	Remainder
	2	0.32	0.44	0.25	1.2	1.5	0.03	0.01	0.15	0.003	"
	3	0.80	0.31	0.22	1.0	1.1	0.02	0.03	0.02	0.001	"
Comparative Examples	4	0.08	0.43	0.17	1.1	1.1	0.01	0.01	0.01	0.001	"
	5	0.21	0.39	0.25	0.4	1.2	0.01	0.02	0.60	0.002	"
	6	0.21	0.42	0.72	1.0	2.5	0.01	0.03	0.12	0.002	"
	7	0.31	0.83	0.24	1.1	1.2	0.02	0.51	0.13	0.003	"
	8	1.60	0.11	0.06	2.0	0.51	0.01	0.04	0.02	0.002	"

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[Table 2]

Steps		Present Invention	Comparative Examples						
		A	B	C	D	E	F	G	H
Homogenization	Temperature	580°C, 6 hours						450°C, 6 hours	
Hot-rolling	Draft	99.5%					86%	99.5%	
	Temp. upon completion	320°C		280°C	320°C	280°C	320°C		
Cold-rolling	Draft	0%	30%	0%					
Annealing	Dew point	25°C			50°C	25°C			
	Temp. increase	High rate(1)		Gradual temp. increase(2)	High rate				Gradual temp. increase
	Holding temp.	500°C							
	Holding time	10 seconds		1 hour	10 seconds				1 hour
	Cooling	High rate(3)		Gradual cooling(4)	High rate(3)				Gradual cooling
Cold-rolling	Draft	82%				90%	82%		

(Notes)
(1) Rapid temperature increase: 250°C per minute
(2) Gradual temperature increase: 50°C per hour
(3) Rapid cooling: 250°C per minute
(4) Gradual cooling: 50°C per hour

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[Table 3]

	No.	Component	Step	After painting and baking (205°C, 10 min.)			Earing ratio (%)	Grain size after annealing (μm)	Surface properties of can-body	Cracking during forming	Tool burn
				TS (kg/mm^2)	YS (kg/mm^2)	E (%)					
Present Invention	1	1	A	31.6	27.4	7	-1.7	90	**O**	**O**	**O**
	2	2		33.8	28.7	6	-1.8	95	**O**	**O**	**O**
	3	3		32.6	28.2	7	-1.9	80	**O**	**O**	**O**
Comparative examples	4	1	B	30.8	27.0	7	-5.8	40	○	○	**O**
	5		C	28.3	24.5	8	-3.2	150	×	○	**O**
	6		D	31.5	27.2	7	-1.7	90	×	**O**	**O**
	7	2	E	34.8	30.7	6	-5.4	85	○	○	**O**
	8	4	A	31.2	26.3	7	-1.8	80	○	○	△
	9	5		29.4	25.1	8	-1.9	130	×	×	×
	10	6		34.1	29.0	8	-1.7	90	×	△	○
	11	7		33.6	28.4	6	-1.8	65	○	×	○
	12	8		26.2	23.1	9	-1.4	60	**O**	×	×
	13	1	F	30.7	26.8	7	-4.9	140	×	○	**O**
	14	2	G	33.9	28.6	6	-2.8	155	×	△	**O**
	15		H	28.2	24.6	8	-2.9	155	×	△	**O**

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As is clearly shown by these tables, the samples manufactured according the present invention have excellent surface properties, strength, earing ratio, and shaping properties. By contrast, the comparative examples have low productivity either because some of the items tested produced poor results or because there was a need to deal with a large number of issues.

(Effect of the Invention)

As described above, the method for manufacturing a formable aluminum alloy according to the present invention is effective in yielding high productivity and producing a can-body material that has excellent surface properties, strength, earing ratio, and shaping properties. Manufacturing costs can therefore be reduced.

Applicant: Furukawa Aluminum Corporation
Agent: Toshizo IIDA, Patent Attorney

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Karen Leyton
Chief Operating Officer

Subscribed and sworn to before me this 26th *day of* September ,2006

Notary Public Eugene J. Joseph Jr.

Notary Public's Seal
EUGENE J. JOSEPH, JR.
NOTARY PUBLIC
MY COMMISSION EXPIRES JAN. 31, 2007

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email: kbleyton@tls-translations.com – www.tls-translations.com

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JAPANESE / ENGLISH TRANSLATION OF

Source: Japanese Patent No. JP 2-37954 A

Title of the Invention: Low Pressure Casting Device

Your Reference No.: 02-2453

For: Alcoa

Requester: Kimberly Merichko

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(12) Unexamined Patent Gazette (A) 2-37954

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(54) Title of the Invention: Low Pressure Casting Device

(21) Application No.: 63-187151

(22) Date of Filing: July 27, 1988

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SPECIFICATION

1. Title of the Invention

Low Pressure Casting Device

2. Claims

(1) A low pressure casting device that characterized in that gas is used to apply pressure to a metallic surface of a melt, and a moisture content of the pressurized gas that pushes the melt up into a die via a stalk is kept at 4 g/cm^3 or less at absolute humidity.

3. Detailed Description of the Invention

(Field of Industrial Utilization)

The present invention relates to a low pressure casting device.

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(Prior Art)

Low pressure casting devices wherein a melt is held in a heated air-tight crucible, [one end of] a stalk is inserted into the melt, the other end of the stalk protrudes from the crucible and is connected to the melt injection port of a die, gas is used to apply a pressure of 0.2 to 2.0 kgf/cm^3 to the melt in the crucible to cause the melt to move up into the stalk, and the melt that has risen into the stalk is introduced into and fills the die are mainly used in aluminum alloy die casting.

(Problems to Be Solved by the Invention)

A variety of aluminum alloys are extensively used in casting, but with aluminum/silicon-based silumin alloys, pinholes readily tend to appear in sand-mold castings. Pinholes also readily tend to appear with alloys of aluminum, silicon, and magnesium, which improve upon such silumin alloys.

The same tendency also occurs when these alloys are cast using a low pressure casting devices.

Aluminum alloys have recently come into widespread use in wheels for vehicles due to their high suitability to the weight and design of such wheels.

Wheels used for vehicles are important components in regard to vehicle safety, and if pinholes and the like are present therein, their reliability decreases.

Accordingly, when casting a wheel made of an aluminum alloy by means of a low pressure casting device whereby pressurized gas is fed to the surface of a melt to push up the melt, a problem is presented in that the factors contributing to the formation of pinholes must be eliminated to as great an extent as possible.

(Means Used to Solve the Above-Mentioned Problems)

The present invention was perfected in order to overcome the aforedescribed problem, and is a low pressure casting device characterized in that gas is used to apply pressure to the

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metallic surface of a melt, and the moisture content of the pressurized gas that pushes the melt up into a die via a stalk is 4 g/cm^3 or less at absolute humidity.

(Operation of the Invention)

In the low pressure casting device, the melt is introduced into a die via an action whereby a pressurized gas is fed to the surface of the melt to apply an upward pressure thereon. Accordingly, when casting is performed with the low pressure casting device, it is believed that moisture in the pressurized gas dissolves in the melt, and, once the pressure has returned to normal within the die, is emitted from the melt depending on the solubility of the gas relative to the melt.

Dissolved aluminum alloys readily react with the moisture, and oxides of the alloy components are readily produced as a result of such reactions. The water vapor created from the oxides and moisture tend to form pinholes in the aluminum alloy casting.

If the moisture content of the pressurized gas is kept at 4 g/cm^3 or less at absolute humidity, as in the present invention, the factors underlying the above are largely eliminated, and the incidence of pinhole formation in the end product can be greatly reduced.

(Working Examples)

As shown in FIG. 1, a dehumidifier (4) is coupled partway along a pressurized gas pipe (3) running from an air compressor (1) used as a pressurized gas delivery device and ending at an airtight crucible (2). The moisture content of the pressurized gas is kept at 4 g/cm^3 or less at absolute humidity. A melt having the alloy composition below was used to produce a vehicle wheel via a stalk (5) using low-pressure casting. The resulting product had substantially no pinholes formed therein.

Si: 5.0% to 9.0%
Mg: 0.15% to 0.55%
Fe ≤ 0.40%
Cu ≤ 0.2%

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Ti ≤ 0.2%

Ni ≤ 0.1%

Zn ≤ 0.2%

Mn ≤ 0.2%

Al: remainder

(Effect of the Invention)

As has been described in detail in the foregoing, the low pressure casting device of the present invention is advantageous in that casting can be performed with aluminum alloys without any pinholes being formed in vehicle wheels, which are an important component relative to the safety of the vehicle, even with a device wherein a pressurized gas is supplied to the surface of a melt to force the melt upwards, which significantly contributes to the formation of pinholes. Accordingly, the present invention provides an exceptionally valuable contribution to industrial progress.

4. Brief Description of the Drawings

FIG. 1 is a schematic diagram of the low pressure casting device pertaining to the working example of the present invention.

1: Air compressor

2: Airtight crucible

3: Pressurized gas pipe

4: Dehumidifier

5: Stalk

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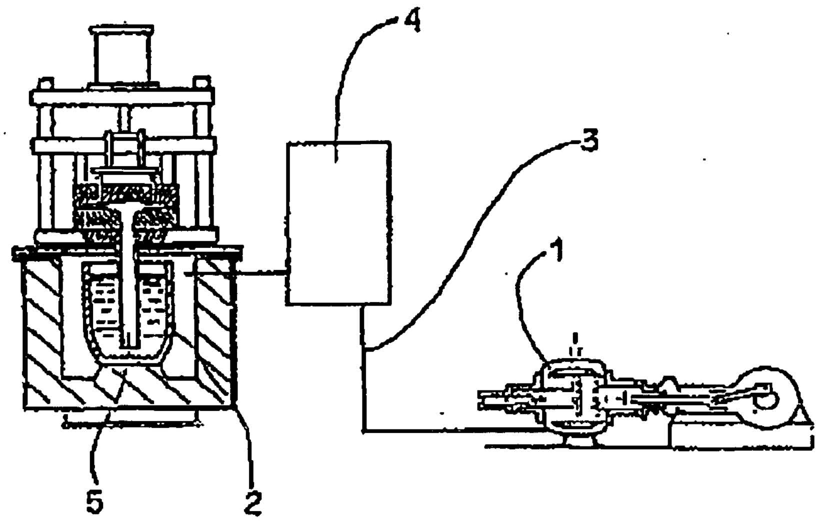
FIG. 1



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